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COLORADO RIVER AQUEDUCT

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

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Officers of the Board of Directors

●

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W. P. WHITSETT

Vice-Chairman
FRANKLIN THOMAS

Controller
D. W. PONTIUS

Secretary
S. H. FINLEY

Treasurer
CHARLES H. TOLL

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General Manager and Chief Engineer
F. E. WEYMOUTH

Assistant General Manager
J. L. BURKHOLDER

Assistant Chief Engineer
JULIAN HINDS

General Counsel
JAMES H. HOWARD

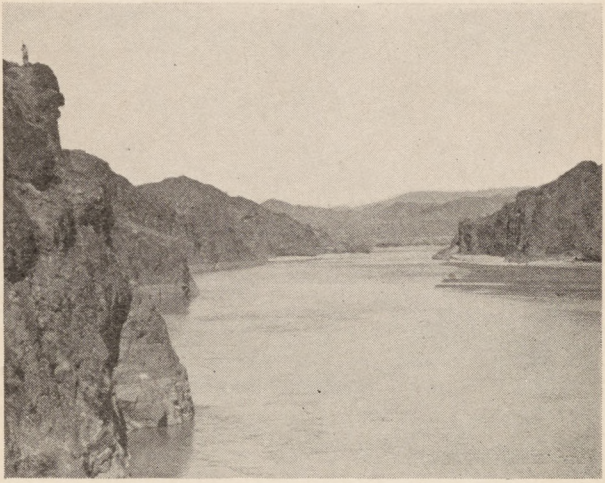
Assistant Controller
J. M. LUNEY

●

Headquarters: 306 West Third Street, Los Angeles, California.
Field Headquarters: Banning, California.

DISTRICT CITIES AND DIRECTORS

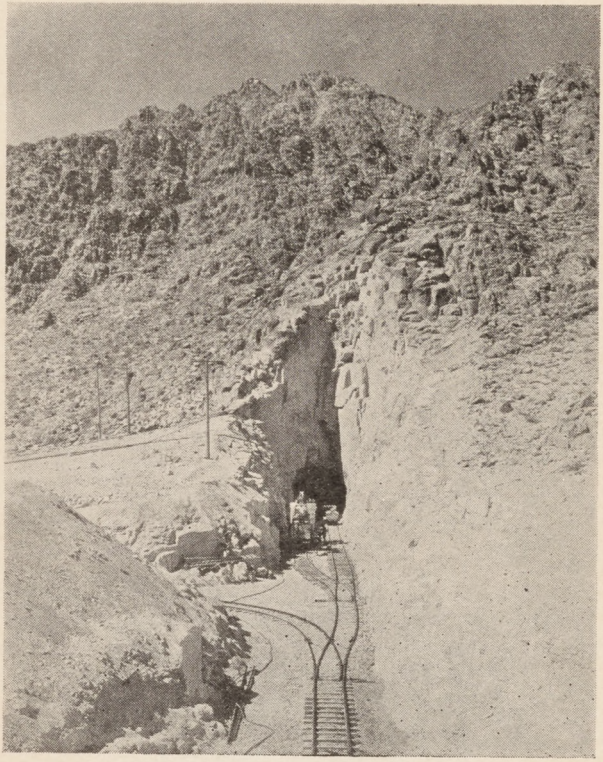
City	Director
Anaheim	O. E. Steward
Beverly Hills	George R. Barker
Burbank	J. L. Norwood
Compton	William H. Foster
Fullerton	Walter Humphreys
Glendale	Frank P. Taggart
Long Beach	William M. Cook
Los Angeles	I. Eisner
Los Angeles	Perry H. Greer
Los Angeles	Walter A. Ham
Los Angeles	D. W. Pontius
Los Angeles	John R. Richards
Los Angeles	Victor H. Rossetti
Los Angeles	W. P. Whitsett
Pasadena	Franklin Thomas
San Marino	J. H. Ramboz
Santa Ana	S. H. Finley
Santa Monica	Arthur A. Weber
Torrance	J. R. Jensen



Aqueduct Intake on Colorado River

Answers to Your Questions Concerning the Colorado River Aqueduct

October 1933



East Portal, Coxcomb Tunnel

Progress of Aqueduct Work

1. **What is the status of Aqueduct construction work?**

   Work is under way and contracts have been awarded by the Metropolitan Water District on approximately one-third of the total construction program on the main line of the Aqueduct. All of this work and these contracts involve a total investment and obligation of approximately $60,000,000. This work includes:

   (a) Construction of 428 miles of high voltage transmission line to supply electric power for construction and camp use along the Aqueduct route. This work is practically completed.

   (b) One hundred fifty-four miles of surfaced highway paralleling sections of the Aqueduct inaccessible from state highways. This work is practically completed, and 130 miles actually in use.

   (c) One hundred eighty miles of five, six, and eight inch water supply mains to carry water from wells drilled by District engineers along and near the Aqueduct route to the numerous construction camps for construction and domestic use. This work is completed.

   (d) Eighty-four miles of tunnels, sixteen feet in diameter, on which actual con-

struction work is under way or contracts have been awarded (26 miles of this tunnel work is being carried forward by forces employed directly by the District).

(e) Construction of Aqueduct field headquarters at Banning, now completed, and three division headquarters located at Berdoo Canyon, Iron Mountain, and the Copper Basin, all along the Aqueduct route.

In addition to the work under way or contracted for directly by the District, a contract has been signed between the United

Pushawalla Camp, Coachella Division

States Government and the District covering the construction of the Parker Dam on the Colorado River at the Aqueduct intake. The United States Reclamation Service is to construct this dam for the District, and the cost of the project is to be paid by the District. In addition, also, the Pine Canyon Dam, now more than half completed, is being built by the City of Pasadena in conformity with the requirements of the District, and is to be taken over as an Aqueduct storage basin by the District when the Aqueduct begins to deliver water to Southern California.

2. **How much time will be required for Aqueduct construction?**

   About six years. Work has been in progress since March 1, 1933.

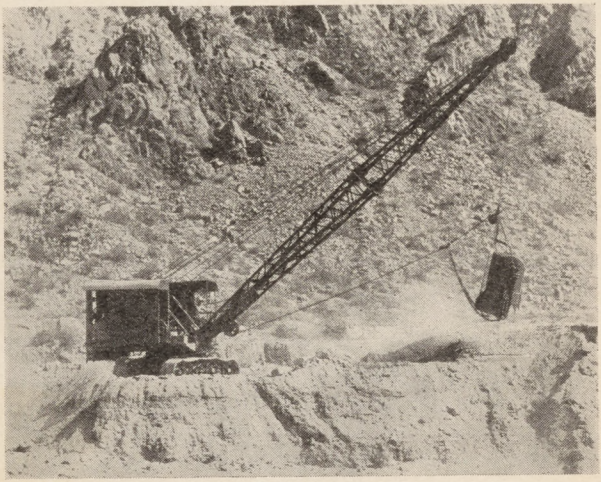
3. **How many men will be employed on the job?**

   An average of 10,000 men over the full construction period. At peak employment approximately 16,000 men will be employed. More than 3,500 workers are now on the job (October 1, 1933), with this number being increased by 500 every month. In the event that negotiations between the District and the Public Works Administration for a grant of money are successful, it is estimated that the Aqueduct construction program will be so accelerated as to move forward peak employment of 16,000 men to four months after

the granting of the money by the Federal Government.

4. **What is the District's employment policy?**

To be eligible for employment applicants must be American citizens and submit proof of residence in the District for one year prior to the date of application. The work is prorated among citizens of the member cities of the District. Ex-service men with dependents, when qualified, are given preference. Labor registration offices have been established in convenient locations in all member cities of the District. Engineering and clerical applications



Dragline Shovel at Work on Aqueduct

are received by the personnel division at District headquarters, 306 West Third Street, Los Angeles.

5. **Has a wage scale been established?**

In compliance with the state law, the Metropolitan Water District has established a scale of wages to be paid. This scale has been made public, and is available to interested persons at headquarters of the District.

6. **Is the Aqueduct being constructed by the District itself or by contractors?**

Under a policy which was established by the Board of Directors, construction is being carried forward under both systems. The Coachella Division of the Aqueduct, made up of 26 miles of tunnels in the Little San Bernardino Mountains, is being constructed by forces directly in the employ of the District under the direction of District engineers. At the present time, all other work going forward is being done by contractors.

7. **What is the policy of the District as to the purchase of local materials?**

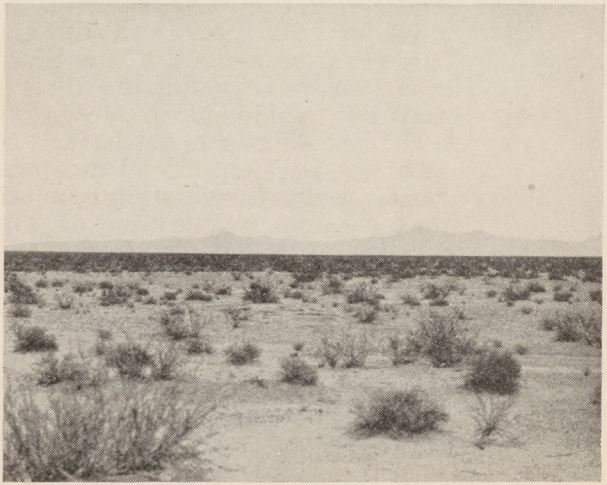
The first aim of the District in this connection is to secure materials and supplies at the lowest possible cost to the District. Other factors, such as price and quality being equal, preference is given to the local bidders.

Aqueduct Financing

8. **Are there any steps being taken to eliminate the necessity of collecting any taxes whatsoever during Aqueduct construction?**

Yes.

(a) It is provided in the Metropolitan Water District Act that Aqueduct bond funds may be used to pay interest charges during the construction period, thus eliminating the necessity of collecting any tax money to pay interest charges on these bonds during the period of construction. Approxi-



Typical Desert Country Along Aqueduct

mately one-third of the main Aqueduct construction work is already under way and contracted for, and the cost of this work is several million dollars under the original cost estimated—thus leaving a margin of bond funds available. The validity of the section of the Act just referred to will be established in the California courts before bond funds are so used.

(b) In the Federal Government's National Recovery Act it is provided that the Public Works Administration may give money amounting to 30% of the cost of materials and labor to such public works as the Colorado River Aqueduct. The District has applied for this grant of money. If this grant of money is received by the District it may be used to pay interest on outstanding Aqueduct bonds, and thus eliminate the necessity of making any tax levies whatsoever during the Aqueduct construction period.

9. **What additional benefits will be derived from securing assistance from the N.R.A.?** Such assistance would immediately and greatly relieve unemployment in all the cities in the District. Under the District's present normal construction program 5,000 men can be employed on the aqueduct by January 1, 1934. If the Government grants the District's application, construction

work on the Aqueduct immediately will be accelerated to the extent that 16,000 men will be on the job within four months thereafter.

10. **How will the cost of Colorado River water compare with the average cost of domestic water in the United States?**

In 183 of the largest cities of the United States, the average maximum domestic rate for water is eighteen cents per 100 cubic feet. Careful studies of present and future water consumption in District cities reveal that if an average rate **even less** than this nation-wide average is charged, sufficient revenue will be derived to

Approach Cut of Thousand Palms Tunnel

pay all bond interest, operating and maintenance charges entirely from water revenues. However, each city in the District has the power and right to decide how it is to meet its share of Aqueduct costs. Each city will therefore decide whether it desires to pay all Aqueduct costs from water revenues, or whether it desires to meet these costs in part from water revenues and in part from taxation.

Part of the Army of Aqueduct Workers

Why We Need Colorado River Water

11. **What is the average rainfall of Southern California?**

Southern California is a semi-arid region located on the edge of the great American desert with an average annual rainfall of 15 inches.

12. **Is this rainfall sufficient to support the development of this region?**

No. At the present time, Southern California is using all of the available annual rainfall, and, in addition, is drawing 200,000,000 gallons a day from its underground water supplies in order to make up the balance. This means a rapid depletion of our present water resources.

13. **What is the evidence of this overdraft?**

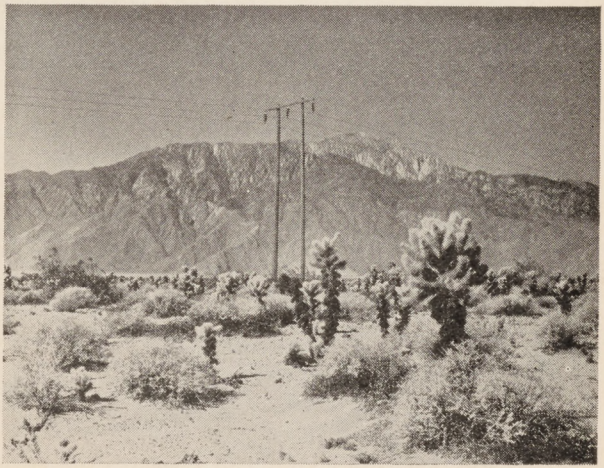
Water levels are dropping anywhere from 2 to 20 feet a year. The great artesian well belt which a few years ago underlay 315 square miles has practically disappeared. Wells in the foothill regions have reached bedrock and are being pumped from depths as low as 350 feet.

14. **With these lowering levels do we face any danger of the seepage of ocean water?**

Along the coast already 47 square miles of water land have been ruined by the intrusion of salt water. Wells put down more than a mile from the ocean have brought in salt water.

15. Is the Colorado River the only remaining adequate source of water supply for the Metropolitan Water District?

Yes. Ten years of painstaking investigation and survey have determined that only from the Colorado River can sufficient water be taken to insure the stability of the cities of the Metropolitan Water District and to protect them from the menace of draught. From no other source within reach is there sufficient water for these purposes, all other supplies having been fully developed and utilized.



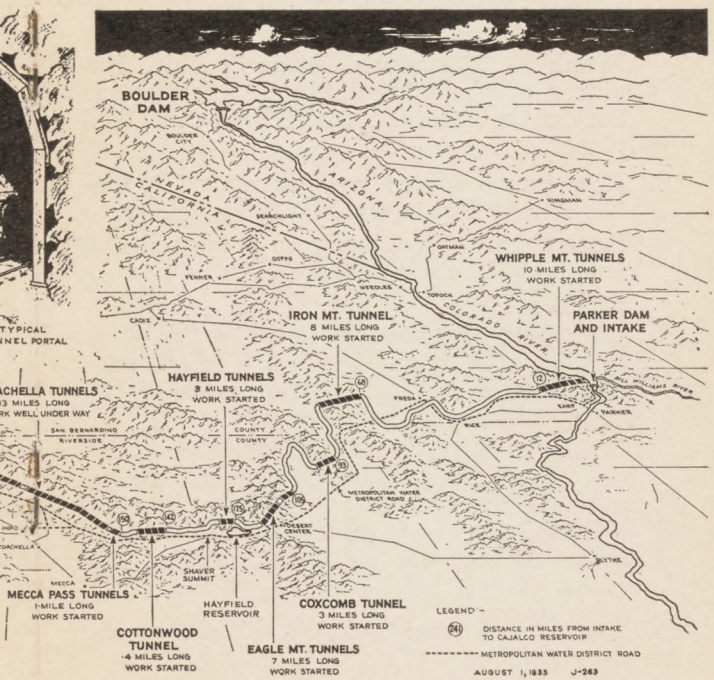
Aqueduct Power Line

COLORADO RIVER

Map Indicates Construction Work Under Way as Early as August, 1, 1933.

TYPICAL TUNNEL POR

R AQUEDUCT MAP



General Information on The Colorado River Aqueduct

16. **When was the first survey work launched on the Colorado River Aqueduct?**

October, 1923.

17. **Who is Chief Engineer of the Metropolitan Water District?**

Frank E. Weymouth, formerly Chief Engineer of the United States Reclamation Service, is General Manager and Chief Engineer.

18. **How many routes were surveyed before the Parker Route was finally selected?**

More than 100 routes were projected and studied before the final selection of a route was made.

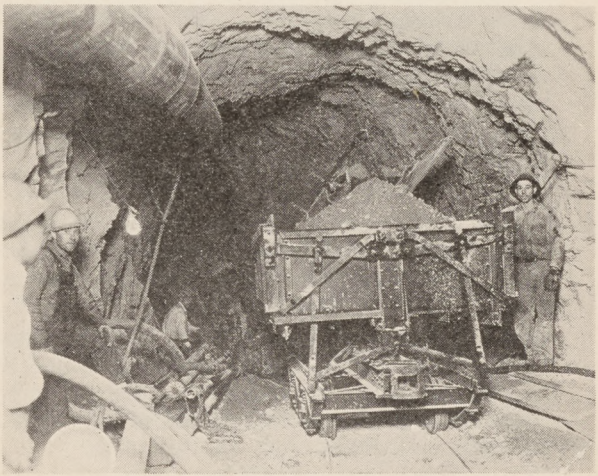
19. **Who were the members on the Board of Review who made the final recommendation of a route for the Aqueduct of the Metropolitan Water District?**

Thaddeus Merriman, Chief Engineer of the New York City Board of Water Supply; A. J. Wiley, Consulting Engineer for the United States Government on the Boulder Dam; Richard R. Lyman, Consulting Engineer of Salt Lake City.

20. **Why was the Parker Route selected by the Board of Review?**

1. The Parker Route is the cheapest route, all elements of cost and operation considered.

2. The Parker Route is the only route providing intermediate storage.
3. The Parker Route for its entire length is on the soil of California and no question of taxes or assessments in any other state is involved.
4. The net operating cost per acre foot on the Parker Route after retirement of the bonds will be lower than that on any of the other practicable routes considered.
5. Geological studies have determined that the Parker Route passes over the safest and most suitable terrain.



Interior of East Coachella Tunnel

21. What are the general features involved in the construction of the Colorado River Aqueduct?

Length of Aqueduct to terminal reservoir	241 Miles
Total length of canals	66 Miles
Total length of conduits	56 Miles
Total length of pressure pipe lines	28 Miles
Total length of tunnels	91 Miles
Total length of distribution system initial installation	144 Miles
Length of tunnels on distribution system	11 Miles
Grade conduits on distribution system	7 Miles
Pipe lines—all types	126 Miles
Diameter of tunnels	16 Ft.
Height of conduits	16 Ft.
Width of conduits	19 Ft.
Height of diversion dam	280 Ft.
Water delivered to cities per year	980,000 Acre Ft.

22. Does the Colorado River Aqueduct Bond Issue include funds to build the distributing mains necessary to deliver water to each city in the District?

Yes. Of the total bond issue voted by the people September 29, 1931, the amount of $44,964,000 is set aside and designated to be used for the construction of Aqueduct distributing lines from the terminus of the main Aqueduct at Cajalco Reservoir to each city in the District. It is thus guar-

anteed that Colorado River water will be delivered to each city in the District without any additional capital cost.

23. What will be the average capacity of the Colorado River Aqueduct?

1500 second feet. Approximately one billion gallons per day, the same quantity as is now in use in the Metropolitan area of Southern California.

24. Will each of the member cities have an assured right to a proportionate share of the water delivered by the Aqueduct?

Yes. According to the ratio that the accumulation of amounts paid by such city toward the capital cost and operating expense of the District's works shall bear to the total payments received by the District toward such capital cost and operating expense.

25. Will Aqueduct water be delivered to each member city under sufficient pressure to reach its reservoirs?

Yes.

26. What is the quality of Colorado River water?

Comparison with the standards of the U. S. Treasury Department, Public Health Service, for public water supplies, shows the Colorado River water to be well within the requirements set for an acceptable water supply. Colorado River water is now and for many years has been successfully

used for both domestic and irrigation purposes in Yuma and the Imperial Valley. It irrigates crops of every kind including citrus trees in Arizona and Imperial Valley. As a result of innumerable tests by Federal, State, City, and District authorities, Colorado River water has been found to be of good, standard quality.

27. **Will the quality of Colorado River water be harmfully affected by salt deposits in the Boulder Canyon Reservoir?**

No. Exhaustive and thorough studies on this subject have been made over a period of fifteen years or more by the United States Geological Survey, and this responsible Federal Government agency has found that the quality of Colorado River water for domestic and irrigation use will in no way be affected or injured.

A conclusive answer to this question is also found in the comprehensive report on the Colorado River Aqueduct project prepared by the eminent Engineering Board of Review retained by the Metropolitan Water District to study and pass upon all phases of the Aqueduct project. This report was made by Thaddeus Merriman, chief engineer of the New York Board of Water Supply; A. J. Wiley, at that time consulting engineer on the Boulder Dam and the Panama Canal; Richard R. Lyman, distinguished consulting engineer of Salt Lake City.

In this report, made in December, 1930, the three engineers stated:

"In our preliminary report of December 21, 1929, we recommended that detailed studies and investigations be made of the salt deposits in the Virgin Valley so that the exact situation and all the facts in regard to them would be available. This recommendation has been carried out and the results of the surveys and geological examinations show that the exposed area of the salt beds is only 1¾ acres and that the total area of the salty ground is 6⅓ acres. This total area is about the same as that of two or three city blocks, or less than five one-thousandths of one per cent of the total surface of the Hoover Reservoir.

"We have twice examined and studied these deposits on the ground. Our direct observations and the results of the surveys and geological examinations have convinced us that this salt cannot possibly, under any condition, produce any injurious effect. The volume of the water in the Hoover Reservoir is so great and the quantity of salt in these beds is so small that if all of the salt were suddenlv dissolved to a depth of 10 feet the effect would be so slight that it would be absolutely imperceptible. (This of course is an impossible assumption.)

"Thus is the problem made simple. It is one which should not cause the slightest

concern or apprehension. All of the prophecies as to the effect of these salt beds have been based on fear and apprehension rather than on fact and knowledge. Nevertheless, in spite of what we have said, if there should remain in any mind the slightest doubt, we recommend that these salt beds and the surrounding salty ground be covered with a blanket of clay and earth to a depth of ten feet. The effect of such a blanket will be that of making conditions practically the same as if the salt beds had never existed. The estimated cost of such a covering is about $40,000, and this cost is a measure of the inconsequential nature of the problem which these salt beds present."

28. **Does Colorado River Water contain fluorine or any other substance that will be injurious in any way to human health?**

No. The most conclusive answer to this question is found in the fact that Colorado River water has been used exclusively for domestic purposes in Yuma, Arizona, for the past seventy-five years, and in Imperial Valley ever since the settlement of that area, more than thirty years ago. Not one single case of mottled enamel teeth, or any other condition which might be traced to fluorine, has ever been found or recorded in either Yuma or Imperial Valley where the children or adults were raised exclusively on Colorado River water. Dr. Giles S. Porter, head of the Depart-

ment of Public Health of the State of California, recently made the following statement: "Imperial Valley has used nothing but Colorado River water for drinking purposes for the past thirty years, and not one case of mottled enamel teeth has developed within the Valley."

Questionnaires sent to every practicing dentist in Imperial Valley by Dr. L. E. Ford, Dean of the University of Southern California College of Dentistry, have revealed in the answers returned by these dentists that not a single case of mottled enamel teeth has been found in the children born and raised in Imperial Valley.

Instances of mottled enamel teeth found in a small settlement along Muddy Creek far above Boulder Canyon Dam have been cited by opponents of the Colorado River Aqueduct project in an effort to frighten uninformed persons. It should be pointed out that analyses of Muddy Creek water show that it has no greater quantity of fluorine than some of the water now being used for domestic purposes in Southern California. Furthermore, Muddy Creek contributes only a small fraction of one per cent of the water in the Colorado River, and its mineral content, therefore, is diluted practically to the vanishing point. This dilution, of course, will be tremendously increased upon the filling of Boulder Reservoir.

Exhaustive analyses have been made of

Colorado River water in the main channel of the river, as well as in its tributaries. These analyses reveal that the fluorine content of some of the domestic water supplies now being used in Southern California is greater than that of Colorado River water.

29. **Upon what basis has the legal right of the Metropolitan Water District been established to the diversion of 1500 second feet of Colorado River water?**

This right is based on:

1. A determination that unused and unappropriated water of many times the required amount will be available for diversion after regulation of the Colorado River flood run-off.

   The U. S. Supreme Court by the decision of May 18, 1931, in the Arizona lawsuit against the Boulder Dam, recognized the right of the Federal Government to regulate and impound the waters of the Colorado River.

2. A contract of April 24, 1930, with the United States, for water from the Boulder Dam reservoir. The quantity of flood waters to be so impounded and salvaged by the United States will be many times the amount required by the District.

3. Filings with the Division of Water Resources of the Department of Public

Works of California, to appropriate under State law, the amount required by the District from the regulated flow of the Colorado River, such appropriative right to complement and strengthen the District's right by contract with the United States.

4. Contracts and agreements with the agricultural group of the Colorado River Valley in California, which limit and define the rights of the members of this group to portions of California's share of Colorado River water.

Desert and Mountain Country Along Aqueduct

30. **By what method will money be provided to carry the cost of aqueduct construction?**

On September 29, 1931, citizens of the Metropolitan Water District voted, by a 5-to-1 majority, a $220,000,000 Colorado River Aqueduct bond issue. This bond issue was upheld as valid by the California Supreme Court, and on September 13, 1932, the Federal Government's Reconstruction Finance Corporation pledged itself to bid on and buy Colorado River Aqueduct bonds up to the sum of $40,000,000, thus making available sufficient funds to finance construction work on the project over the first two years. It was agreed that the Metropolitan Water District could offer these bonds to the Corporation in quantities as needed by the District.

31. **Will the retirement of bonds begin at once?**

In view of the program of construction necessary before revenues from the sale of water will be available, it is provided that the bond maturities may be deferred for a period of 15 years.

32. **How long will it be before the Metropolitan Water District bonds are retired?**

The bonds will be retired serially, payable over a 50-year period from the date sold.

33. **During the period of construction will the member cities pay any taxes to the District?**

Interest charges during the period of construction may be paid from taxes.

34. Will the Aqueduct work be carried on so that only the minimum amount of interest will have to be paid during the years of construction?

Yes. Bonds will be issued only as actually needed to pay the obligations.

35. May any city having revenues from water sales use such revenues to avoid taxation?

Yes. This may be done in whole or in part. Any city desiring that the rate payers purpurchasing water, as distinguished from the taxpayers, should bear the expenses of the District, may pay to the District all or any part of the revenues which would otherwise be collected by taxation on its property owners and thereby eliminate all or any part of the taxes.

36. In what way will the total amount of the water brought in by the Aqueduct be apportioned to the member cities?

Each city is entitled to water in exact proportion to the amount of money paid in by that city to the District. The larger municipalities which will be called on to pay a larger portion of the Aqueduct cost will automatically receive a larger portion of the water. And, likewise, those cities which receive a smaller portion of the water will pay a smaller part of the cost.

What is the Metropolitan Water District?

37. What is The Metropolitan Water District of Southern California?

It is a confederation of non-contiguous cities in the South Coastal Basin, organized under the Metropolitan Water District Act for the purpose of developing a domestic and municipal water supply from the Colorado River.

38. Why was it necessary to form such a District?

Because Southern California needed additional water. The smaller cities, individually, could not finance an Aqueduct from the Colorado River. Collectively, these cities can do that which they could not accomplish single handed.

39. How is the District governed?

By a Board of Directors consisting of at least one representative from each city, this representative being appointed by the chief executive of the city with the approval of its legislative body. Any city having an assessed valuation of $200,000,000 or more may appoint one additional representative for each $200,000,000 of such valuation, but such representatives shall cast the vote to which their city would otherwise be entitled as a unit, and

as a majority of such representatives present at the directors' meeting shall determine. The Metropolitan Water District Act provides that no city shall have over 50 per cent of the total number of votes of all the member cities, no matter how large that city may be. The members of the Board of Directors serve without pay or compensation of any sort.

40. What cities are included in the District?

Anaheim, Beverly Hills, Burbank, Compton, Fullerton, Glendale, Long Beach, Los Angeles, Pasadena, San Marino, Santa Ana, Santa Monica and Torrance.

Boulder Dam and the Aqueduct

41. What is the relation between the Boulder Dam project and the Colorado River Aqueduct?

Regulation of the Colorado River's flow is necessary in order to make water more certainly available for the Aqueduct at all times. The present low flow is appropriated and used. It will also be necessary to pump water for the Aqueduct, and to do this a large supply of hydroelectric energy at low cost will be required. Such a supply will be generated at the Dam.

42. Did the signified intent of the Metropolitan Water District to build the Colorado River Aqueduct have any influence on the Federal authorities in the design of Boulder Dam, in the appropriation of funds to carry on the work, and in the rapidity with which the work should be prosecuted?

Yes. Boulder Dam is being rushed to completion by the Government largely because it is universally recognized that Southern California urgently needs the water to be made available by the Dam.

43. Will delay in financing and building the Aqueduct have any effect in the securing of additional appropriations from Congress for the continuation of construction on Boulder Dam project?

Yes. Because at the time Boulder Dam legislation was considered, Congress was assured by Southern California that the water to be impounded by the Dam was needed acutely. Congress passed the Swing-Johnson bill under the assumption that Southern California would carry out its part of the water program.